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Some Economic Aspects of Jute Production in Bangladesh - An Inter-District Study

by

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Some Economic Aspects of Jute Production in Bangladesh - An Inter-District Study.

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Mahabub Hossain & M. A. Quddus*

The share of Bangladesh in the world production of jute and allied fibres declined substantially since the partition of the Indian sub-continent. Her share in the world production was over 80 percent in 1947-48; this has come down to only 37 percent in 1969-70. Jute yield per acre declined so much in Bangladesh over this period that increase in production was insignificant inspite of substantial acreage expansion. On the other hand, in other countries growing jute and allied fibres increase in both acreage and yield resulted in a much greater increase in production with consequent decline in the share of Bangladesh.

In order to obtain some useful insights into the factors responsible for the decline in Bangladesh's share in world jute production, it may not be enough to rely on an aggregative analysis for the country as a whole. The situation in regard to changes in yield and acreage of jute is not similar in all areas of the country. An analysis of regional differential in the production of jute in Bangladesh assumes special significance in this context.

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Further a districtwise analysis may provide a better basis for deriving some policy implications regarding jute production in the country.

The present paper attempts to study some economic aspects of jute production compared to its substitute crop, aus rice, in 15 jute growing districts of Bangladesh. The specific aspects that have been studied are the movements of acreage, yield and production of jute during the period 1947-48 to 1969-70[1/], the marginal product of land in jute and in aus rice, the acreage elasticity of production in these two crops, and price parity that should prevail between these two crops in order to make them equally profitable to the growers.

The paper is divided into five parts. In part II there is a brief discussion on the sources and nature of the data on which the study is based. Part III presents the trend in production, acreage and yield rates of jute in the districts during 1947-48 to 1969-70. The hypothesis that has been put forward to test is that there is no difference in the movements of acreage, yield rates and production in the districts of the country during this period. In part IV we estimate the marginal product of land in jute and aus rice, the acreage elasticity of production and the marginal gross and net revenue product. Part V estimates the price

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1/ 1969-70 was chosen as the last year as this was the latest normal year before the war of liberation broke out in Bangladesh.

parity between jute and aus rice. At the end of the paper there is a brief statement of the policy implications that can be derived from the study.

II

Sources and nature of data:

The data that form the basis of this study have been drawn from a number of published and unpublished sources.

Acreage and production:

Districtwise data on acreage and production of jute and aus from 1947-48 to 1969-70 have been taken from the Bureau of Agricultural Statistics as reported in their "Agricultural production levels" in Bangladesh. Data on acreage and production of aus for 1968-69 and 1969-70 have been supplied by the Bureau but for jute they were obtained from the Jute Board [6].

Some qualifications about the nature of the acreage data are in order. As reported in [2], the method of estimation of acreage of production of rice and jute was not the same throughout the whole period. Till 1964-65 they were estimated by the subjective methods more commonly known as the method of eye estimation; but from 1965-66 it was replaced by the objective method[2/] i.e.,

2/ A scrutiny of the estimated acreage for jute by the subjective and objective methods and that reported in [2] shows that the subjective method of estimation was completely replaced by the objective method only in 1968-69. From 1965-66 to 1967-68 a sort of average between subjective and objective estimate were reported.

the method of sample survey. Larson made comparison between the results of objective surveys and subjective surveys for a number of years and showed that in terms of objective surveys the acreage data estimated by the subjective surveys tended to be under-estimated in the case of jute and overestimated in the case of aus rice [8]. And so he stressed the need for revising the acreage figures till 1964-65 which were reported from the subjective surveys.

Difficulties have been encountered in trying to adjust the data accordingly. The first problem is to decide which method of estimation gives a more accurate picture of the acreage figures. While the subjective method of estimation may have a downward bias the objective method of estimation may have an upward bias. And in the absence of knowledge of the actual correction factor that has to be used any adjustment may give a more distorted picture of the actual acreage figure than the official records.

For Bangladesh as a whole the acreage series of jute before 1965-66 was revised by assuming that the estimated acreage by subjective method was underreported by 9 million acres for each year[3/]. Several price response studies indicate that the cash crops like jute are highly responsive to the change in prices. Assuming that jute in Bangladesh is highly price responsive a Nerlovian dynamic supply response model (adjustment) was fitted

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3/ The objective acreage estimate for 1965-66, 1966-67 and 1967-68 was higher than the subjective acreage estimate by around.9 million acres. See Larson [8], Table 3.

to both the official and the revised acreage series. The following results were obtained.

(a) Official Series

$$A_t = .6123 + .03008\ P_t + .2373\ A_{t-1}$$
$$R^2 = .66$$

(b) Revised Series

$$A_t = 2.09764 + .01341\ P_{t-1} - .00526\ A_{t-1}$$
$$R^2 = .23$$

Where A_t = acreage under jute in period t and P_t = price of jute in period t. The result of this investigation clearly indicate that the revised series is more distorted than the official series. The model applied to the revised series have a very poor explanatory power compared to that applied to the official series. Whereas in the case of official series the price of jute explains 66 percent of variation in acreage under jute in the case of the revised series it explains only 23 percent of the variation.

The above discussion and investigation should give sufficient grounds in favour of using the official acreage figures for jute in our study.

Prices:- District-wise growers' price of aus paddy used in the study was supplied by the Directorate of Agricultural Marketing and are given in appendix table IV (a). District-wise growers' price of jute was not available and as such the provincial growers'

price of jute was taken as the representative price of the districts. The provincial growers' price of jute has been computed from the monthly growers' price reported in [6] weighted by the monthly arrival of jute in the market in the same year.

Costs of Production:- District-wise costs of production of jute are not available for any recent years. Pakistan Central Jute Committee took up a scheme for the estimation of the cost of production of jute during the year 1957 [4]. According to the scheme the costs of production of jute and aus paddy were studied for all the districts in our study. Per acre cost of production for both varieties of jute, capsularies and olitorious, and of aus paddy were computed from the survey. The total costs per acre included costs due to a) Rent and Interest (b) Seed and Manure c) Human Labour and (d) Bullock labour.

Wage payments to human labour included both payment made to hired labourers and imputed payments to family labourers on the basis of market wage rates. These costs were representative of 1958-59 i.e., the time of survey.

These cost figures were revised to make them representative of the year 1969-70 on the basis of the following assumptions (i) family labour is 50 percent of the total labour required per acre in both jute and aus.

(ii) Opportunity cost of family labour is zero[4/].

4/ Costs have also been calculated on the basis of an alternative assumption that the costs of family labour is 50% of the cost of hired labour (see Appendix table V). But such cost figures have not been used in the text.

(iii) Per acre requirement of seed, manure, human labour and bullock labour have remained the same in 1969-70 as in 1958-59. Use of chemical fertilizer is very insignificant in both Aus and Jute.

(iv) The costs of other inputs remained the same in 1969-70 as in 1958-59 but the wage rate for labourers have increased in proportion to the increase in the consumers' price index.

The revised cost figures are given in appendix table V. The costs of rent and interest have been excluded because the amount of this cost is a historical datum, not necessarily related to the current conditions. Assuming that the farm will remain in existence during the short run period under consideration only the costs of land preparation showing, weeding and harvesting and subsequent operations are important.

III

Trend in Acreage yield rates and production of jute - 1947-48 to 1969-70.

Jute acreage and production are subject to violent short term fluctuations due to climatic conditions and economic factors like change in relative prices. In order to discern the trend, it is necessary to remove such fluctuations in yearly observations. For this reason, the period under study have been divided into four sub-periods i.e., 1947-54, 1954-60, 1960-65 and 1965-70. Annual

averages of acreage, yield and production of jute have been used to show the movements of these variables over the period under study.

Table 1 presents the absolute acreage, yield, and production of jute in 1947-54 and the indices of these variables in the later three periods taking 1947-54 as base in the 15 jute growing districts of the country. In order to have an aggregative view of the movements in these variables the table also presents the same information for the 3 jute growing areas comprising these districts as well as for Bangladesh as a whole.

Several things to be noted from Table 1. The trend in acreage and yield of jute (the direction of change) is the same in all the three areas and in almost all the districts except a few minor districts like Dinajpur, Barisal and Noakhali. Acreage under jute reached the botton in the second period after which it tended to rise continuously. But in the case of yield, it reached the peak in 1954-60 and thereafter tended to fall. But there is significant variation in the magnitude of change in both acreage and yield rates among the districts. In the period of acreage contraction the fall in acreage is much less in the major jute growing districts like Mymensingh, Rangpur, Dacca and Comilla than the minor districts. Similarly, in the period of acreage expansion, the increase in acreage is also much less in the major districts than that in the minor districts. Substantial acreage expansion have taken place in the districts of Faridpur, Jessore and Khulna.

In the case of yield, the magnitude of change is the highest in Jat area, moderate in Northern area and is the least pronounced in District area.

More important to note from the table is the relationship between the movement of acreage and yield rates. There is an inverse relationship between the movement of acreage and yield. An increase in acreage in almost all the districts have been associated with fall in the yield rates and viceversa. Two factors can explain this relationship; (i) there has been no technological improvement in the production of jute during the period under study and (ii) The expansion and contraction in jute acreage has taken place on the less fertile lands with the consequent that marginal yield is less than the average yield. So when acreage fell average yield rose and viceversa.

In the case of production there is significant difference in the trend among the districts over the period under study. In the districts belonging to Jat area and in Rangpur there is a rising trend in production throughout the period. The reason can be found from the fact that in these districts when acreage fell yield rate increased more than proportionately and when acreage rose the yield rates fell less than proportionately. A change in production is the combination of the change in acreage and yield[5/]. Production increased

5/ It can be shown that a change in production is the sum of the change in acreage plus the change in yield rates plus the interaction of the change in acreage and yield rates. In this case, since the relationship between the acreage and yield is inverse, the interaction of the change in acreage and yield will always be negative.

in all the periods in these districts because in period of acreage contraction, positive yield effect has offset negative acreage and interaction effect; and in period of acreage expansion, the positive acreage effect has outweighed the negative yield and interaction effect.

In Northern (except Rangpur) and District Areas production fell in period II after which it tended to increase. This is because, in these areas (with a few exception) a change in acreage have been associated with a less than proportionate change in yield rates. So in period of acreage contraction (period II) positive yield effect has been outweighed by the negative acreage and inter-action effect; but in period of acreage expansion (Period III & IV); the positive acreage effect has offset the negative yield and inter-action effect.

From the analysis of the change in production and its components - acreage and yield, it is clear that the relatively insignificant growth in production of jute in the districts is not due to the absolute decline or stagnation in jute acreage, but due to a decline growth in yield of jute. The following factors seem to be responsible for the declining yield rates in jute.

In the past highest priority has been given to attainment of foodgrain-selfsufficiency. So efforts were concentrated on increasing yield of cereals through technological improvements involving use of improved seeds, irrigation, chemical fertilizers and pesticides. But in the case of jute no such improvements have taken

Table I

District-wise Trend in Acreage, Production and yield of Jute.

Indices 1947-54 = 100

	Acreage				Yield				Production			
		Indices				Indices				Indices		
	Area (100 acres)	1954-60	1960-65	1965-70	1947-54 mds/acres	1954-60	1960-65	1965-70	1947-54 100 bales	1954-60	1960-65	1965-70
Jat Area	7402	92	117	132	16.40	120	107	87	24967	110	125	115
Dacca	1749	91	103	119	16.90	115	102	87	6082	104	105	103
Mymensingh	4139	92	121	140	15.97	124	110	87	13597	114	133	122
Comilla	1514	93	124	127	16.98	113	104	87	5288	106	129	111
Northern Area	4759	77	91	125	14.65	123	112	91	14341	94	102	114
Rajshahi	949	65	102	103	15.17	109	101	76	2961	71	103	78
Dinajpur	832	59	44	135	14.07	126	107	93	2408	74	46	125
Rangpur	2264	86	103	140	14.96	125	116	92	6967	108	120	128
Bogra	714	83	89	99	13.65	131	117	104	2005	108	104	102
District Area	4734	80	92	146	15.92	109	101	90	15507	88	92	131
Pabna	838	80	102	136	15.64	112	112	94	2696	89	114	128
Faridpur	1505	85	94	170	16.25	112	96	85	5030	94	91	144
Jessore	788	69	82	178	16.56	105	106	91	2684	72	87	162
Barisal	367	84	76	105	16.07	102	92	84	1213	86	70	88
Kushtia	363	55	102	117	15.65	108	91	81	1169	60	93	95
Sylhet	324	102	108	76	15.93	97	97	99	1062	98	93	67
Noakhali	315	102	87	125	13.55	128	111	103	878	131	97	124
Khulna	254	66	79	156	14.83	113	101	104	775	74	80	162
Bangladesh	16941	84	102	134	15.75	118	107	89	54894	100	110	119

place. Unlike rice, jute did not benefit from international research efforts for yield improvements. Further, due to lack of proper coordination between extension workers and research centres, whatever knowhow had been developed locally in the Jute Research Institute could not reach the farmers.

Another factor is the lack of proper incentives to the jute growers. Relative costs per maund of jute and rice remaining constant, the relative profitability of jute depends on the jute - rice price ratio. Appendix table IV(B) shows that the jute - rice price ratio declined from 0.98 in 1947-54 to .77 in 1965-70. Also the Govt. fiscal policy in the past had adversely affected the interest of the jute growers. The export duty on raw jute and the export bonus on jute manufacturers have been intended to redistribute income from the poor jute growers to the rich jute manufacturers [7].

Since the beginning of the 1960's, cultivation of some high yielding varieties of rice like Irri-8 have been introduced in Bangladesh. These cost reducing innovations in rice cultivation together with the high price of rice relative to jute have induced the farmers over time (i) to redistribute land between jute and rice in such a way that the better quality lands are put under rice cultivation (ii) to extend jute acreage, if at all, on less fertile lands when land reclamation took place and (iii) to take less care on the cultivation of jute relative to rice.

That the farmers have paid less attention to jute production relative to aus rice overtime can be viewed from table II. The table presents the mandays requirements per acre in jute and aus rice in two periods 1958-59 and 1969-70. The sources for the two periods are different and the results are obtained from sample surveys; so the sampling error may also be different in the two periods. For this reason, the relative mandays requirements in jute to aus have been compared instead of absolute mandays. The table shows that in all the 6 districts for which data are available relative use of human labour in the case of jute declined to a great extent in 1969-70 compared to that in 1958-59.

TABLE II

Relative use of Mandays in Jute & Aus Production Per Acre

Districts	1958-59			1969-70		
	Mandays used per acre in jute	Mandays used per acre in Aus	Mandays used in jute relative to Aus	Mandays used per acre in jute	Mandays used per acre in Aus	Mandays in jute relative to Aus
Dacca	114.64	80.31	1.43	56.92	52.82	1.08
Mymensingh	124.90	60.63	2.06	90.04	72.78	1.21
Comilla	121.88	62.76	1.94	93.16	55.83	1.67
Rangpur	116.95	70.13	1.67	84.22	60.67	1.39
Rajshahi	108.87	66.49	1.64	91.75	72.99	1.26
Jessore	104.02	65.66	1.84	83.10	57.81	1.44

Source:- 1958-59 [4] and 1969-70 computed from a survey done by Planning Unit Ministry of Agriculture.

All these factors were combined to yield decreasing returns on marginal land in the case of jute. This is confirmed in the next section where returns from marginal land in jute are presented. Since acreage under jute expanded from the beginning of the 1960's the yield of jute has tended to decline from that period.

The basic conclusion that can be drawn from the study of the movement of acreage, yield and production over 1947-70 is that the expansion of acreage under jute has taken place on the margin without any attention being given to the increase in yield rates therefore, the increase in production has been insignificant. Any future policy for increasing jute production should pay more attention to increase in yield, rather than expansion of area under jute.

IV

Marginal Physical Product Marginal Revenue Product and Acreage Elasticity of Production in Jute and Aus rice

The observed fall in the absolute yield of jute over the period under study has tempted us to estimate the production on marginal land in jute in order to know more confidently whether the decline in yield is due to expansion of jute cultivation on less fertile marginal lands. Production of aus rice on marginal land has also been estimated. Since these are the two principal crops of the summer season and are competitive, a knowledge of the marginal productivity of the two crops may guide one in

optimally re-distributing lands among these two crops. A comparison of these estimates can also reveal whether from the growers point of view it is justifiable to increase jute production by switching over land away from aus rice.

Our estimates of the marginal physical product of land and the acreage elasticity of production are based on linear production function of the following type:-

$$Y = a + bx + e$$

where Y = Production in hundred tons (bales in the case of jute)

X = Area under the crop in hundred acres

and C = the error term.

Detailed production functions incorporating production to all factors of production could not be estimated due to lack of the relevant series of data. So the coefficient of land in the regression includes the contribution of other factors of production. However there is one saving point. In view of the existence of disguised unemployment in agriculture in Bangladesh, the marginal productivity of labour can be assumed to be zero. In that case estimated 'b' should fairly represent the marginal contribution of land to production. Attempt was, however, made to incorporate time as an explanatory variable to represent the technology but failed due to the problem of multicollinearity as acreage under Aus rice in all the districts and that of jute in some districts was highly correlated with time. Preliminery enquiry with the data

showed that linear function fitted better than log-linear function of the Cobb-Dauglas type.

Regressions of the above type was run for both jute and aus for the 15 jute growing districts using 23 years' data from 1947-48 to 1969-70. The results of the regressions are shown in table III. The value of the acreage coefficient in the case of jute is in bales and in the case of aus rice it is in tons.

In the case of jute, acreage explained more than 80 percent of the variation in production in six districts; in seven cases the degree of variation explained is between 50 to 80 percent. Only in case of Mymensingh and Rangpur, acreage explained less than 50 percent of the variation. In Aus rice, acreage explained more than 80 percent of the variation in 8 cases; 50 to 80 percent of the variation in 5 cases and only in Kushtia and Pabna, acreage explained less than 50 percent of the variation in production. The standard error of the estimated coefficient of acreage indicates that this coefficient is significantly different from zero in all the cases.

The estimated marginal physical product of land is the value of the regression coefficient of acreage. For comparison, the coefficients of jute and aus rice have been transformed into maunds and are presented in table IV. The table also gives the average product of land in 1969-70 for comparison with the marginal products. As is evident from this table, in the case of jute the marginal product of land is less than the average product in all districts

except Noakhali, Sylhet, Barisal and Kushtia. But in the case of aus the marginal product of land is higher than the average product except in Pabna. Marginal product of land in jute is the highest in Sylhet and the lowest in Rangpur. In case of aus rice, physical returns from marginal land is the highest in Kushtia and is the lowest in Pabna.

The acreage elasticity of production given in table IV indicate how much percentage change in production would be due to one percent change in acreage under the crop in question. On the assumption that labour has a negligible contribution to production, this elasticity also indicates the degree of the returns to scale in the production of the crop in question. In jute, the value of the elasticities are less than unity (except Sylhet) but in rice, they are greater than unity. The results thus indicate that acreage expansion of jute would lead to a less than proportionate increase in production but in rice, expansion would lead to a more than proportionate increase in production. However, there are significant differences in the value of these elasticities among the districts in both jute and rice. On the average, the elasticity is the highest in District area in jute but in Northern Area in rice.

These findings have one important policy implication regarding jute production. It has been shown that the acreage elasticity of production in jute though less than unity in Bangladesh, is higher in districts where jute occupies a less important

TABLE III

Regressions showing the relationship between acreage and Production of jute and aus rice

Name of the Districts	Jute				Aus Rice			
	a	b*	Standard error of 'b'	R^2	a	b**	Standard error of 'b'	R^2
Dacca	136.79	2.7250	.5989	.4964	-38.04	.4571	.0434	.8521
Mymensingh	554.69	2.2175	.5074	.4763	-50.63	.3924	.0681	.6122
Comilla	101.86	2.9012	.4532	.6602	-70.29	.4962	.0794	.6501
Faridpur	138.56	2.3902	.2536	.8087	-16.60	.3401	.0287	.8687
Noakhali	27.77	2.9778	.4030	.6903	-28.27	.4200	.0572	.7221
Pabna	27.70	2.9973	.1712	.5935	- 0.74	.3157	.1055	.2987
Jessore	34.89	2.9402	.1614	.9404	-28.62	.4308	.0631	.6899
Sylhet	-10.32	3.5677	.4688	.7340	-33.77	.5014	.0313	.9244
Barisal	1.49	3.0914	.3171	.8197	-17.16	.3896	.0276	.9048
Khulna	12.47	2.5077	.2261	.8542	- 7.24	.4538	.0329	.9006
Kushtia	11.66	2.6341	.2577	.8326	-72.40	.5584	.1351	.4453
Rangpur	375.93	1.7008	.4540	.4006	-69.32	.4492	.0465	.8153
Rajshahi	65.04	2.2656	.4105	.5918	-46.14	.4781	.0691	.6948
Bogra	63.62	2.1741	.4907	.4966	-19.29	.4458	.0438	.8317
Dinajpur	37.69	2.5146	.2634	.8128	-21.57	.4455	.0170	.9700
Bangladesh	2240.60	2.0205	.3800	.5738	-902.62	.4932	.0412	.8723

* in bales ** in tons.

TABLE IV

Estimated Marginal Physical product & Acreage Elasticity of production in Jute and Aus Rice

Name of the Districts	Jute			Aus Rice		
	Marginal physical product (in mds.)	Average product of land per acre in 1969-70 (in mds.)	Acreage* Elasticity of production	Marginal physical product (in mds)	Average product of land per acre in 1969-70 (in mds.)	Acreage* Elasticity of production
Dacca	13.25	15.12	.78	12.99	9.97	1.32
Mymensingh	10.78	14.18	.76	10.68	7.75	1.15
Comilla	14.10	15.36	.83	13.51	10.53	1.43
Rangpur	8.27	13.32	.52	12.23	9.70	1.26
Rajshahi	11.01	11.33	.77	13.02	9.94	1.37
Bogra	10.57	13.56	.69	12.14	9.00	1.31
Dinajpur	12.22	13.22	.83	12.13	10.16	1.25
Faridpur	11.62	14.53	.74	9.26	7.78	1.13
Noakhali	14.48	13.76	.97	11.43	8.73	1.27
Pabna	14.57	15.31	.90	8.59	9.51	1.01
Sylhet	17.34	14.92	1.11	13.65	12.19	1.39
Jessore	14.29	14.68	.87	11.72	9.10	1.17
Barisal	15.03	14.12	.99	10.01	9.84	1.14
Khulna	12.90	14.58	.85	12.35	11.17	1.22
Kushtia	12.80	12.74	.88	15.11	7.30	1.63
Bangladesh	9.82	14.20	.61	13.43	9.53	1.42

* Elasticity at the mean level was computed as $b \frac{\bar{X}}{\bar{Y}}$ where b is the estimated coefficient of acreage, $\bar{x}$, is mean acreage, and $\bar{y}$ is mean production.

position in the cropping pattern than that in relatively major jute growing districts. This means that if the acreage expansion policy is to be pursued for increasing production, technology remaining constant, it is far more preferable to do so in the minor districts than in the major ones because the former will have the minimum adverse effects on the yield rates of jute.

The marginal gross revenue product of jute and aus given in Table V are obtained by multiplying the marginal physical products by the prices prevailing in 1969-70. In the case of aus districtwise growers' prices of aus paddy[5/] have been used but in the case of jute due to the non-availability of districtwise prices, provincial growers' price have been used. Marginal net revenue products are the marginal gross revenue products less the costs of production per acre of land. Costs per acre exclude costs due to rent and interest.

The difference between the marginal gross revenue and marginal net revenue between jute and aus given in column 3 and column 6 respectively represent how much additional revenue can be earned by a marginal redistribution of land (shift of one acre of land) from aus rice to jute. The table shows that the difference is negative in Dacca, Rangpur, Rajshahi and Kushtia in the case

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5/ They have been transformed into rice (cleaned) equivalents multiplying by 1.5; because it is assumed that 1.5 maunds of paddy is equivalent to 1 maund of rice.

TABLE V

Estimated Marginal Gross and net revenue Product of Jute and Aus Rice

Name of the Districts	Marginal Gross Revenue in Jute	Marginal Gross revenue in Aus	Difference between (1) - (2)	Marginal net revenue Product in Jute	Marginal net revenue product in Aus	(4)-(5)
Dacca	394.58	409.08	-14.50	201.83	238.26	-36.43
Mymensingh	321.02	320.40	0.62	127.77	191.73	-63.96
Comilla	419.89	384.94	34.95	202.09	238.03	-35.94
Rangpur	246.28	320.95	-74.67	78.00	198.48	-120.48
Rajshahi	327.87	371.07	-43.20	172.45	241.45	-69.00
Bogra	314.77	314.12	0.65	165.08	183.80	-18.72
Dinajpur	363.91	277.39	86.52	201.50	139.06	62.45
Faridpur	346.04	295.16	50.88	165.88	149.16	16.72
Noakhali	431.21	355.65	75.56	242.99	223.85	19.14
Pabna	433.89	251.16	182.73	276.84	117.67	159.17
Sylhet	516.38	386.26	130.12	303.60	256.89	46.71
Jessore	425.55	327.33	98.22	246.93	196.28	50.65
Barisal	447.59	255.17	192.42	292.57	143.49	149.08
Khulna	384.16	367.99	16.17	191.82	201.67	- 9.85
Kushtia	381.18	389.61	- 8.43	238.16	271.68	-33.52

of gross revenue and in Dacca, Mymensingh, Comilla, Rangpur, Rajshahi, Bogra and Khulna and Kushtia in the case of net revenue. The result thus indicates that in these districts marginal redistribution of land would decrease the total net revenue earned by the farmers from the cultivation of these two crops. The fall in revenue is seen to be the highest in the major jute growing districts like Mymensingh and Rangpur. However, such redistribution is seen to increase the net revenue in almost all the districts of District area and in Dinajpur,

i.e., the relatively minor jute growing districts of Bangladesh.

The policy implication that can be derived is that if we want to increase acreage under jute by taking lands away from aus rice to jute without adversely affecting growers' interest, it should be done in the districts of Faridpur, Noakhali, Pabna, Sylhet, Jessore, Barisal and Dinajpur. In other districts, acreage distribution should be in favour of aus rice if the objective is to maximise growers' profitability.

V

Estimated jute - rice price ratio

The price of raw jute is interlinked with the price of rice in two ways (i) rice is the alternative crop to be grown on jute lands and (ii) jute growers will have to purchase rice with the sale proceeds of their jute. It is the jute rice price ratio which largely influences the decision of the grower as to how much land he will put under jute relative to rice. If the jute rice price ratio is favourable to the latter the growers will prefer to shift more land under rice. So, in order to assure that the cultivation of jute and rice is equally profitable, a critical jute rice price ratio should be maintained. The Govt. can indeed increase jute production by maintaining the actual price ratio between jute and rice above the critical jute rice price ratio and thereby providing more incentives to the growers to increase acreage under jute.

The critical jute rice price ratio at which the production of jute and rice will be equally profitable can be calculated from the profit maximisation conditions under the assumption of perfect competetion. Let us suppose that a farmer produces two crops, aus and jute which are perfectly competetive in respect to the use of the factors of production and that he had no land constraint. He can always increase his profits by bringing more land into the cultivation of jute so long as the revenue earned by cultivating an additional unit of land, say one acre, is greater than the cost of cultivating jute in that unit. So, in order to maximise profit he will produce jute on that amount of land for which the marginal revenue earned is just equal to the marginal cost. His profit maximising condition is then given by

$$MP_j \; P_j = MC_j \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where MP_j = Production of jute on the marginal land per acre.

P_j = Price of jute.

MC_j = Cost of producing jute on the marginal land per acre.

Similarly for Aus rice, the profit maximising condition is given by

$$MP_A \; P_A = MC_A \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

where MP_A = Production of Aus rice on the marginal land per acre

P_A = Price of Aus Rice

and MC_A = Cost of Producing aus rice on the marginal land per acre

Price ratio between jute and aus rice can be obtained by dividing equation (1) by equation (2) as follows:-

$$\frac{P_j}{P_A} = \frac{MC_j}{MC_A} \frac{MP_A}{MP_j} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

If one assumes that costs of production per acre of average land is equal to the cost of production per acre of marginal land in both aus and jute, the critical jute/rice price ratio can be computed from the equation ...(3) by using the data in our hand. However, this is a simplifying assumption, because this assumes that costs of production per acre is invariant of the size of land under the crop. But we had no other alternative but to assume it in view of the non-availability of the marginal cost figures.

The estimated price of jute relative to rice for the districts are given in Table VI. The ratio of the marginal productivity of aus rice relative to the marginal productivity of jute is also given. If the cost of production on marginal land is equal in both jute and aus, this ratio can also be taken as the estimated price ratio. The ratio is the lowest in Pabna and the highest in Rangpur.

The estimated critical jute rice price ratios can be used to calculate the minimum price of jute that should prevail in the country. Table VI shows the price ratio is less than 1.5 in all the districts except in Rangpur. This means that if the price of jute is fixed at a level which is 1.5 times the price of rice, jute growers in 14 out of 15 districts will have an incentive to produce more jute; only in Rangpur there will be an incentive to redistribute

TABLE VI

Estimated price parity between Jute and Aus Rice

Name of the Districts	$\frac{MP_A}{MP_j}$	$\frac{C_j}{C_A}$	$\frac{P_j}{P_A}$
Dacca	.98	1.13	1.11
Mymensingh	.99	1.50	1.49
Comilla	.96	1.48	1.42
Rangpur	1.48	1.37	2.03
Rajshahi	1.18	1.20	1.42
Bogra	1.15	1.15	1.32
Dinajpur	0.99	1.17	1.16
Faridpur	0.80	1.23	0.98
Jessore	0.82	1.36	1.12
Pabna	0.59	1.18	0.70
Sylhet	0.79	1.64	1.29
Noakhali	0.79	1.43	1.13
Khulna	0.96	1.16	1.11
Barisal	0.67	1.39	0.93
Kushtia	1.18	1.21	1.43

land in favour of rice. We, therefore, suggest that the growers' price of jute should at least be 1.5 times the growers' price of rice.

Some Policy Conclusions

In this paper we have studied the movement of acreage, yield and production of jute in 15 jute growing districts of Bangladesh from 1947-48 to 1969-70 and estimated returns from marginal land (per acre) in jute and its competetive crops, aus rice. Attempt

was also made to estimate a price parity between jute and aus rice that would make these two crops equally profitable to the growers, technology and other things remaining constant.

If the data on which this study is based is not that much unreliable, the findings of the study appears to give rise the following policy conclusions.

1) In the past production of jute was sought to be increased through devoting more area under jute cultivation without paying any attention to the yield of jute. Since some cost reducing technological change had taken place in competing crops of jute, such policy, had an adverse effect on the yield of jute. So any future policy for increasing jute production should pay more attention to increase in yield through technological change rather than only by bringing more acreage under jute.

2) If acreage expansion policy is to be pursued for increasing jute productions, this should be done in the minor jute growing district rather than in the major ones, because in the former districts acreage expansion appears to have had the minimum adverse effect on the yield of jute.

3) If acreage under jute is to be expanded by taking lands away from aus rice without adversely affecting growers' interest this should also be done in the minor districts. For, at 1969-70 prices and costs marginal redistribution of land in

favour of jute appears to increase growers' profitability in the minor jute growing districts whereas in the major ones like Mymensingh, Rangpur, Dacca and Comilla such redistribution is seen to reduce growers' profitability.

4) The growers' price of jute should be 1.5 times higher than the growers' price of aus rice at the national level. For, a districtwise study of the critical jute rice price ratio appears to indicate that a 3 : 2 price ratio between jute and rice would induce the farmers' to produce more jute in all districts except in Rangpur.

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Appendix Table 1

Districtwise Trend in Production of Jute

Districts	Production (in 100 bales) Average 1947-54	Average 1954-60	Average 1960-65	Average 1965-70
Dacca	6082	6328	6370	6278
Mymensingh	13597	15607	18062	16594
Comilla	5288	5606	6814	5867
Jat Area	24967	27541	31246	28739
Rajshahi	2961	2100	3049	2318
Dinajpur	2408	1777	1115	3022
Rangpur	6967	7502	8343	8943
Bogra	2005	2169	2093	2052
Northern Area	14341	13548	14600	16340
Pabna	2696	2401	3062	3462
Faridpur	5030	4751	4562	7237
Jessore	2684	1942	2330	4353
Barisal	1213	1038	844	1063
Kushtia	1169	701	1087	1107
Sylhet	1062	1044	984	707
Noakhali	878	1146	854	1091
Khulna	775	574	618	1257
District Area	15507	13597	14341	20277
Bangladesh	54894	54722	60194	65481

Appendix Table - II

District-wise Trend in Acreage under jute

Areas (hundred acres)

Districts	1947-54	1954-60	1960-65	1965-70
Dacca	1749	1586	1800	2078
Mymensingh	4139	3818	4989	5782
Comilla	1514	1415	1877	1930
Jat Area	7402	6819	8666	9790
Rajshahi	949	619	966	980
Dinajpur	832	488	368	1120
Rangpur	2264	1952	2337	3167
Bogra	714	590	636	704
Northern Area	4759	3649	4307	5971
Pabna	838	667	852	1141
Faridpur	1505	1273	1415	2532
Jessore	788	541	646	1406
Barisal	367	307	279	385
Kushtia	363	201	370	426
Sylhet	324	329	308	218
Noakhali	315	322	275	380
Khulna	254	167	200	395
District Area	4734	3807	4345	6903
Bangladesh	16941	14289	17323	22699

Appendix Table III(A)

District-wise Trend in Yield Per Acre of Jute

Districts	Yield Rates (in Maunds) 1947-54	1954-60	1960-65	1965-70
Dacca	16.90	19.40	17.20	14.69
Mymensingh	15.97	19.87	17.60	13.95
Comilla	16.98	19.26	17.65	14.78
Jat Area	16.40	19.63	17.53	14.27
Rajshahi	15.17	16.49	15.34	11.50
Dinajpur	14.07	17.70	15.12	13.12
Rangpur	14.96	18.68	17.35	13.73
Bogra	13.65	17.87	16.00	14.17
Northern Area	14.65	18.05	16.48	13.30
Pabna	15.64	17.50	17.47	14.75
Faridpur	16.25	18.14	15.67	13.79
Jessore	16.56	17.45	17.53	15.05
Barisal	16.07	16.44	14.71	13.42
Kushtia	15.65	16.95	14.28	12.63
Sylhet	15.93	15.43	15.53	15.77
Noakhali	13.55	17.30	15.10	13.96
Khulna	14.83	16.71	15.02	15.47
District Area	15.92	17.36	16.04	14.28
Bangladesh	15.75	18.62	16.89	14.02

Appendix Table -- III(B)

Districtwise Trend in Yield Per Acre of Aus Rice (cleaned)

Districts	Yield Rates (in Maunds) 1947-54	1954-60	1960-65	1965-70
Dacca	8.41	9.06	11.14	10.61
Mymensingh	8.13	9.39	11.02	9.00
Comilla	8.35	8.67	10.49	10.63
Jat Area	8.23	9.16	10.96	9.74
Rajshahi	8.03	8.48	11.04	10.54
Dinajpur	8.60	8.45	10.16	10.73
Rangpur	8.45	8.88	11.01	10.65
Bogra	7.71	8.53	10.10	10.40
Northern Area	8.30	8.69	10.78	10.64
Pabna	7.96	7.89	9.45	9.15
Faridpur	7.60	8.29	8.52	7.96
Jessore	9.27	9.36	11.04	10.47
Barisal	7.16	9.75	9.83	9.45
Kushtia	8.43	8.53	10.54	9.90
Sylhet	8.03	9.46	10.17	11.15
Noakhali	7.55	8.45	10.29	9.59
Khulna	8.69	9.58	10.49	11.37
District Area	8.21	8.83	9.99	9.64
Bangladesh	8.29	8.99	10.50	10.11

Appendix Table - IV(A)

Growers Price of Aus Paddy per maund (1965-66 to 1969-70)

Name of the Districts	1965-66	1966-67	1967-68	1968-69	1969-70
Dacca	13.36	22.62	21.50	21.50	21.00
Mymensingh	12.80	20.62	21.00	20.96	20.00
Faridpur	15.66	22.12	19.00	23.54	21.25
Pabna	12.16	20.56	19.00	19.50	19.50
Bogra	12.37	18.94	17.50	17.25	17.25
Rangpur	13.20	19.00	16.00	17.50	17.50
Dinajpur	12.25	15.31	14.00	15.25	15.25
Rajshahi	14.58	19.25	17.00	19.00	19.00
Khulna	13.00	21.50	17.00	23.22	19.87
Jessore	13.00	21.31	18.00	20.00	18.62
Kushtia	12.12	18.12	16.00	19.00	17.19
Barisal	14.15	19.84	18.00	20.00	17.00
Comilla	13.58	23.00	20.00	21.85	19.00
Sylhet	11.75	21.56	17.00	20.00	18.87
Noakhali	14.50	21.94	21.50	22.75	20.75

Appendix Table - IV(B)

Price Relatives of Jute & Aus rice (cleaned) from 1947-48 to 1969-70

Years	Price of Jute (Tk.)	Price of Aus (Tk.)	Price Relatives Jute/Aus
1947-48	21.50	24.12	0.89
1948-49	30.25	30.06	1.01
1949-50	20.00	24.50	0.82
1950-51	28.67	19.38	1.48
1951-52	25.75	22.12	1.16
1952-53	10.25	21.00	0.49
1953-54	15.50	15.37	1.01
Average for 1947-54			.98
1954-55	15.62	11.00	1.42
1955-56	18.87	20.69	0.91
1956-57	24.87	31.56	0.79
1957-58	20.62	26.44	0.78
1958-59	16.37	25.44	0.64
1959-60	19.37	26.62	0.73
Average for 1954-60			0.88
1960-61	51.83	24.31	2.13
1961-62	23.63	25.53	0.93
1962-63	20.74	26.35	0.77
1963-64	21.18	23.64	0.90
1964-65	31.47	24.99	1.25
Average for 1960-65			1.20
1965-66	36.52	32.07	1.14
1966-67	29.00	42.88	0.68
1967-68	27.58	42.43	0.65
1968-69	34.01	46.23	0.74
1969-70	29.78	45.26	0.66
Average for 1965-70			.77

Source:- Computed from [10].

Appendix Table - V

Some Alternative Estimates of Costs of Production per acre of Jute and Aus Paddy

(Figures in Taka)

Name of the Districts	Jute				Aus			
	Including Rent	Interest	Excluding Rent	Interest	Including Rent	Interest	Excluding Rent	Interest
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Dacca	277.62	350.52	192.75	265.17	254.22	303.63	170.82	220.23
Mymensingh	254.13	329.82	193.25	268.94	184.85	223.11	128.67	166.93
Comilla	330.90	405.10	217.80	292.00	253.35	287.87	146.91	181.43
Rangpur	207.24	266.21	168.28	227.25	159.93	191.62	122.47	154.16
Rajshahi	193.96	250.24	154.42	211.70	161.14	199.20	129.62	167.68
Bogra	210.34	264.04	149.69	203.39	190.54	227.52	130.32	167.30
Dinajpur	211.69	267.61	162.41	218.13	178.12	211.94	138.33	172.15
Faridpur	210.15	276.77	180.16	246.78	176.35	215.51	146.00	185.16
Noakhali	345.20	409.32	188.22	253.01	291.91	331.55	131.80	171.44
Pabna	184.22	245.45	157.05	218.28	153.48	188.67	133.49	168.68
Sylhet	271.62	349.75	212.78	290.91	167.41	195.53	129.37	157.49
Jessore	203.83	274.25	178.62	249.04	152.52	188.79	131.05	167.32
Barisal	199.93	255.64	155.02	210.73	148.67	178.38	111.68	141.39
Khulna	235.01	297.81	192.34	255.14	210.02	252.78	166.32	209.08
Kushtia	160.83	214.64	143.02	196.82	137.17	167.24	117.93	148.00

(1) Assuming opportunity cost of family labour to be zero

(2) Assuming opportunity cost of family labour to be the 50% of the cost of hired labour.

Appendix Table - VI

Share of Bangladesh in the World Production of Jute and allied fibres

Period	Bangladesh (Area in Million acres)	Yield per acre	Production in million bales	World Prod. in jute & allied fibres in million bales	Share of Bangladesh in world production (%)
1947-48	2.06	3.32	6.84	8.53	80.17
Aver.of 1947-54	1.69	3.24	5.49	9.55	57.51
" 1954-60	1.43	3.83	5.47	13.78	39.70
" 1960-65	1.81	3.43	6.20	17.51	35.41
" 1965-70	2.37	2.83	6.72	19.02	35.23
1969-70	2.54	2.91	7.39	20.73	36.71

Source:- [6_7.

Siraj/
23.10.72